PERIODICAL ROOM
GENERAL LIBRARY
UNIV. OF MICH.

OCT 12 1925

SCIENCE

NEW SERIES
VOL. LXII, No. 1606

FRIDAY, OCTOBER 9, 1925

ANNUAL SUBSCRIPTION, $6.00
SINGLE COPIES, 15 CTS.

The Vertebrate Skeleton

324 Illustrations. Cloth, $6.00

By **J. S. KINGSLEY,** Professor of Zoology, Emeritus, University of Illinois

This new book by Dr. Kingsley traces out the Skeletal elements from early appearance to the adult condition. Greater stress has been laid upon Ichthyopsida and on reptiles than upon birds and mammals. Reference to extinct forms is made. The work is descriptive, with hints on group relationship. A classified bibliography of nearly a thousand works is appended.

Comparative Anatomy of Vertebrates

2d Edition, 406 Illustrations. Cloth, $3.25

By **J. S. KINGSLEY,** Professor of Zoology, Emeritus, University of Illinois

Embryology is made the basis of this text, the various structures being traced from the undifferentiated egg into the adult condition. This renders it easy to compare embryonic stages of the higher vertebrates with the adults of the lower and to recognize the resemblances and differences between organs in the separate classes.

Entomology, Its Ecological Aspects

3d Edition Revised, 313 Illustrations (5 Plates). Cloth, $4.00

By **JUSTUS WATSON FOLSOM,** Sc.D., Assistant Professor of Entomology, University of Illinois.

The author gives a comprehensive and concise account of insects. A great deal of new matter has been inserted in this edition and a new chapter on insect ecology given. The work covers classification, anatomy, physiology, development, adaptation, color, coloration, adaptive coloration, insects in relation to plants, insects in relation to other animals, transmission of disease, interrelations of insects, insect behavior, distribution, insect ecology, insects in relation to man, literature.

Economic Entomology

257 Illustrations. Cloth, $2.75

By **WILLIAM LOCHHEAD, B.A., M.S.,** Professor of Biology, MacDonald College, McGill University, Quebec

It gives the structure, metamorphosis, and bionomics of insects carried on both in the laboratory and field; practice in classification and description of the more common insects in various stages; studies of methods of control; practical exercises in preparation and application of insecticides.

P. BLAKISTON'S SON & CO., Publishers

1012 Walnut Street **Philadelphia, Pa.**

Setchell and Gardner

MARINE ALGAE

of the Pacific Coast of
North America

So far issued 898 pp. (with indexes), 107 plates			$9.25
Part I.	Myxophyceae	138 pages, 8 plates	1.50
Part II.	Chlorophyceae	243 pages, 15 plates	2.75
Part III.	Melanophyceae	506 pages, 74 plates	5.00
Part IV.	Rhodaphyceae	*In preparation.*	

University of California Press

Berkeley, California

LATEST OPEN COURT BOOKS

Pluralistic Philosophies of England and America

By JEAN WAHL

Authorized translation by Fred Rothwell

A careful study of the philosophies advocated by leaders of idealistic monism as compared with the pluralist theories of leading pragmatists. Price $3.00

The Mechanical Investigations of Leonardo da Vinci

By IVOR B. HART

University of London

"For the engineer and man of science generally, the book will be valued because it discusses Leonardo's mechanics, both dynamics and statics, in the light of the celebrated notebooks and also his observations on flight. . ." —"American Machinist." Price $4.00

La Geometrie

By RENE DESCARTES

French-English edition translated by David Eugene Smith and Marcia Latham

The first edition of this famous book was published in 1637, of which the present volume is a facsimile and translation. Price $4.00

OPEN COURT PUBLISHING COMPANY

122 S. Michigan Ave. Chicago, Ill.

Carnegie Institution of Washington

RECENTLY ISSUED BOOKS ON BOTANY AND ECOLOGY

No. 350. **Growth in Trees and Massive Organs of Plants.** Octavo, 118 pp., 29 figs. $1.50
MacDougal, D. T.—Dendrographic Measurements.
Shreve, Forrest.—The Growth Record in Trees.

No. 365. **MacDougal, D. T.** Reversible Variations in Volume, Pressure, and Movements of Sap in Trees. Octavo, 93 pp., 5 pls., 13 figs. $1.00

No. 326. **Hall, H. M., and F. E. Clements.** The Phylogenetic Method in Taxonomy: A Monograph of the North American Species of Artemisia, Chrysothamnus, and Atriplex. Quarto, 361 pp., 58 pls., 47 figs. $6.75

No. 355. **Clements, F. E., and J. E. Weaver.** Experimental Vegetation: The Relation of Climaxes to Climate. Octavo, 179 pp., 15 pls., 41 figs. $2.50

No. 356. **Clements, F. E., and G. W. Goldsmith.** The Phytometer Method in Ecology. Octavo, 112 pp., 11 pls., 45 figs. $1.75

No. 357. **Jean, F. C., and J. E. Weaver.** Root Behavior and Crop Yield under Irrigation. Octavo, 72 pp., 6 pls., 24 figs. $1.25

No. 368. **Cannon, W. A.** Physiological Features of Roots with Especial Reference to the Relation of Roots to the Aeration of the Soil. With a chapter by **E. E. Free** on Differences between Nitrogen and Helium as Inert Gases in Anaerobic Experiments on Plants. Octavo, 168 pp., 21 text-figs. Price later.

The publications of the Institution now number over 500 volumes, the subjects including Anatomy, Archaeology, Astronomy, Botany, Chemistry, Climatology, Economics and Sociology, Embryology, Engineering, Folk-Lore, Genetics, Geology, History, Literature, Mathematics, Medicine, Nutrition, Palaeontology, Palaeography, Philology, Physics, Terrestrial Magnetism, Zoology.

Orders for publications should be addressed to your bookdealer or to

CARNEGIE INSTITUTION OF WASHINGTON

WASHINGTON, D. C.

Publications of

The Philippine Bureau of Science

AMPHIBIANS AND TURTLES OF THE PHILIPPINE ISLANDS. By E. H. Taylor. 193 pages, 17 plates, and 9 text figures; postpaid, $1.00.

THE SNAKES OF THE PHILIPPINE ISLANDS. By E. H. Taylor. 316 pages, 37 plates, and 32 text figures; postpaid, $2.50.

THE LIZARDS OF THE PHILIPPINE ISLANDS. By E. H. Taylor. 272 pages, 23 plates, and 53 text figures; postpaid, $2.50. In press.

VEGETATION OF PHILIPPINE MOUNTAINS. By W. H. Brown. 434 pages, 41 plates, and 30 text figures; postpaid, $2.50.

INDEX TO THE GENERA OF BIRDS. By R. C. McGregor. 185 pages; postpaid, $1.00.

SPECIES BLANCOANAE. By E. D. Merrill. 424 pages; postpaid, $2.25.

AN INTERPRETATION OF RUMPHIUS'S HERBARIUM AMBOINENSE. By E. D. Merrill. 596 pages, 2 maps; postpaid, $3.00.

THE PHILIPPINE JOURNAL OF SCIENCE, a monthly (no longer issued in sections), per year, $5.00.

A list of the publications of the Philippine Bureau of Science and a sample copy of the Philippine Journal of Science will be sent upon request.

Subscriptions and orders for publication should be sent to

THE BUSINESS MANAGER

Philippine Journal of Science

Bureau of Science, Manila, P. I.

SCIENCE

VOL. LXII OCTOBER 9, 1925 No. 1606

CONTENTS

Organization of Chemists in the United States: PROFESSOR CHARLES E. MUNROE 313

Oceanic Circulation: DR. HENRY B. BIGELOW 317

Brayton Howard Ransom: DR. MAURICE C. HALL 319

Henry Rose Carter 320

Scientific Events:

Second Conference on the Standardization of Biological Products; The Columbia-Presbyterian Medical Center; The Shedd Aquarium; The Optical Society of America 321

Scientific Notes and News 323

University and Educational Notes 326

Discussion and Correspondence:

The Underworld of Science: DR. DAVID STARR JORDAN. *Arithmetization in the History of Mathematics:* PROFESSOR G. A. MILLER. *Avoidable Difficulties with Terminology in Comparative Anatomy:* EARL THERON ENGLE. *Luminous Spiders:* EDWARD PIERCE HULSE, DR. BARNUM BROWN 326

Scientific Books:

Wright and Puchstein's Telephone Communication. Terroine's Le métabolisme de base: PROFESSOR GRAHAM LUSK 329

Scientific Apparatus and Laboratory Methods:

A Simple and Efficient Hydrogen Electrode: DR. CHRISTOS P. SIDERIS 331

Special Articles:

Inactivation of Insulin by Glucose with a Comment on the Genesis of Diabetes: PROFESSOR J. R. MURLIN. *Observations on Kidney Function in Necturus Maculosus:* H. L. WHITE and FRANCIS O. SCHMITT 332

Science News x

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa. Garrison, N. Y.

New York City: Grand Central Terminal.

Annual Subscription, $6.00. Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 8, 1879.

ORGANIZATION OF CHEMISTS IN THE UNITED STATES[1]

IN consultation with fellows of the institute who have solicited this address, I find an expectation that, since I have chanced to be associated with the beginnings of several of these organizations and participated at several of the critical stages in their development, I shall be somewhat reminiscent and the address more or less of the nature of a narrative. However, the topic assigned me covers a period much antecedent to my appearance in my present state of existence, but fortunately this field was carefully and completely covered by Dr. H. Carrington Bolton, noted historian and bibliographer of chemistry, lecturer on the history of chemistry at the George Washington University during the last decade of the nineteenth century, and, who, besides his monumental works on chemical bibliography, was author of that graphic story of alchemy and the alchemists, entitled, "The Follies of Science at the Court of Rudolph II."

Bolton presented the results of his researches at a meeting of the Washington Chemical Society on April 6, 1897, under the title, "Early American chemical societies,"[2] while at the 25th anniversary meeting of the American Society, he dealt with the "Chemical societies of the nineteenth century,"[3] and thus supplied material for comparisons as to date of formation, rate of development, and the like, between domestic and foreign societies. In his first paper, Dr. Bolton records three societies, *viz.*, the Chemical Society of Philadelphia, founded in 1792; the Columbian Chemical Society of Philadelphia, founded in 1811, and the Delaware Chemical and Geological Society, organized at Delhi, Delaware County, New York, September 6, 1821. The information Dr. Bolton was able to collect regarding these organizations was meager and his paper consists largely of brief biographical notes of members, showing chiefly that, at the time, such chemical activity and interest in chemistry as existed was largely confined to the medical profession. In conning these names, one notes that several of the more active of the members, like Dr. Robert Hare and Professor James Cutbush, have

[1] Address delivered April 6, 1925, at the annual banquet of the American Institute of Chemists.

[2] *J. Am. Chem. Soc.*, Vol. 19, pp. 719–732 (1897).

[3] Report of the Twenty-fifth Anniversary of the American Chemical Society, April 12 and 13, 1901. Supplement to *J. Am. Chem. Soc.*, pp. 21–35 (1902). This list has been brought down to 1924, by E. Emmet Reid, on pp. 73–77 of his "Introduction to Organic Research."

since received more complete and well-deserved biographical recognition at the hands of Dr. Edgar F. Smith.

Of these organizations, the first and third appear to have been local, but the Columbian Chemical Society appears, from the names and addresses of members quoted, to have been national in scope. The Chemical Society of Philadelphia appears to have existed for some ten years; the others, probably, for but a shorter time.

The statement "that chemical societies were organized and in operation in the United States of America long before they existed in Europe" is calculated to astonish almost every one, including many chemists, yet this assertion is made by Bolton in his address at the twenty-fifth anniversary of the American Chemical Society, and he proceeds to justify his statement by statistics of some sixty-six chemical societies existing in thirteen different countries. Bolton may really have intended his statement to be singular because in his list he cites the Society for Philosophical Experiments, founded in London in 1794, and the Société d'Arcueil, founded in 1807, but there is some doubt as to whether the former was strictly a chemical society, though it might have emphasized chemistry among other subjects of experiment, while the latter appears to have been a private club, which met at Berthollet's residence at Arcueil, then a village about three miles south of Paris.

Of the undoubted chemical societies, the oldest appears to be the Chemical Society, founded in London in 1841. This was followed by the Chemical Society of Paris, founded in 1857; the German Chemical Society, in 1867, and the Russian Chemical Society, in 1868. There were organizations devoted to industries, such as the sugar industry, which were older than some of these. There were, of course, organizations such as the Royal Society of London, the American Philosophical Society, the American Academy of Sciences, and the like, which embraced chemistry, with a wide variety of other topics, as subjects of investigation and treatment, which were older and some much older, than the Chemical Society of Philadelphia.

Among organizations embracing this catholicity of subjects is the American Association for the Advancement of Science. Founded in 1841, as the Association of American Geologists and Naturalists, it enlarged its scope to cover a wider range of sciences in 1848, and on reorganization adopted its new title. My first contact with the association was at the meeting held in Portland, Maine, August 20 to 26, 1873. At that time the association was organized for scientific meetings into Sections A and B, Section A including mathematics, astronomy, physics, physics of the globe, chemistry and mechanics, while Section B embraced geology, paleontology, zoology, anthropology and practical science. This meeting was of special significance for several reasons. Thus, measures were inaugurated to ensure the permanent legal existence of the association. The volume of transactions published was much larger than any preceding it, or any succeeding it, up to 1879, when the record of the popular Saratoga meeting was issued. The number of chemists in attendance was unusually large, there having been, according to my count, forty-one chemists present out of a total of 195; that is, the chemists constituted more than one fifth of the membership present, they having been drawn, no doubt, partly by the location and partly by the fact that a highly esteemed chemist, Dr. J. Lawrence Smith, delivered an address as retiring president. But to us this occasion is of particular importance because of the fact that at this meeting the chemists practically formulated a declaration of independence, holding an impromptu meeting for the presentation of informal papers, and the consideration of the organization of a separate sub-section in chemistry, a resolution to this effect being adopted for presentation at the following meeting at Hartford.

It may be of interest to inquire how representative of American chemistry the chemists assembled at Portland were. I have applied some tests, finding seven out of them became presidents of the American Association for the Advancement of Science, twelve members of the National Academy of Sciences and twelve held the position of president of the American Chemical Society, during fourteen years, thus showing they enjoyed the respect and esteem of their fellow chemists in America. I believe the results of any other gage applied would support this conclusion.

It would not be surprising if, at this day, some wonder were expressed as to the reasons which led the chemists assembled at Portland to take the action they did, especially in view of the purposes of the American Association for the Advancement of Science which, as set forth in the first volume of Proceedings, were and still are as follows:

> The objects of the association are, by periodical and migratory meetings, to promote intercourse between those who are cultivating science in different parts of the United States; to give a stronger and more general impulse, and a more systematic direction to scientific research in our country; and to procure for the labors of scientific men increased facilities and a wider usefulness.

There can be no doubt that all chemists would readily subscribe to the above and the many chemists who have held membership and fellowship in the

American Association for the Advancement of Science, including those at the Portland meeting, have heartily approved of these objects and earnestly cooperated toward their realization, but it was felt that, in the multitude of topics embraced in Section A, chemistry was somewhat submerged. This was the more true because in the then existing conditions of the sciences, chemistry seemed little related to the others, and it needed fuller and more independent expression to bring it to public attention and comprehension.

Following the recommendation of the chemists, the resolutions adopted by them at the Portland meeting of 1873 were presented at the Hartford meeting of 1874, preparations made for permanent organization of a sub-section in chemistry at future meetings, and Dr. Samuel W. Johnson, who had been present at the Portland meeting, was chosen chairman. The first meeting of the sub-section occurred at Detroit in 1875. Dr. F. W. Clarke, who had been most active at Portland, was chosen secretary, and a resolution was adopted by which it was made "the duty of the chairman of the sub-section of chemistry to prepare an address," thus setting the existing custom of vice-presidential addresses now prevailing at meetings of the American Association for the Advancement of Science, and furnishing another medium by which the public might be reached and informed, while Dr. George F. Barker was chosen chairman and Dr. H. Carrington Bolton secretary for the next meeting to be held at Buffalo in 1876. It is worth notice that both these gentlemen were among those chemists in attendance at Portland, for the record shows that those then present were ready to work toward the realization of the objects then sought and secure for chemistry a wider recognition.

In delivering his address on "The atom and the molecule" at the Buffalo meeting, Dr. Barker made a statement of such significance that both Dr. A. C. Hale, in his "History of the American Chemical Society,"[4] and Dr. Marcus Benjamin, in his "Organization and development of the Chemical Section of the American Association for the Advancement of Science,"[5] refer to it in identical terms as follows:

> In beginning his address he alluded to the formation of the American Chemical Society, which he described as an event, "*which is of especial interest to the members of this section*" and in a spirit almost of prophecy said, "*The most agreeable relations exist between the Society and this sub-section. To continue these relations it might be desirable to hold the August Meeting of the Society jointly with that of this sub-section of the American Association.*"

[4] "Twenty-fifth Anniversary," p. 48.
[5] P. 89.

In 1881, the sub-section in chemistry was made a full section and met at Montreal in 1882, as Section C, with Dr. Bolton as vice-president. At the Cleveland meeting in 1888, steps were taken looking to the affiliation of the American Chemical Society and the American Association for the Advancement of Science. This was finally perfected and in 1891, at the Washington meeting, Professor Barker, president of the American Chemical Society, presided over a joint meeting of the two bodies. It was through the chemists that the system of affiliated societies of the American Association for the Advancement of Science, described in SCIENCE for April 3, 1925, was originated and put into effect.

An event of special importance to chemistry in this country, and one having a marked influence on the organizing of its chemists, was the "Centennial of Chemistry," held at Northumberland, Pennsylvania, on July 31 and August 1, 1874. This celebration originated in a letter from Dr. H. Carrington Bolton, which was published on page 362 of the *American Chemist* for April, 1874, in which he said: "The year 1774 was rendered memorable by great chemical activity. It is not possible to assign to chemistry any definite birth-year, but so many remarkable discoveries were made in 1774, that we may, with good reason, date the foundation of modern chemical science from that period." He then briefly alluded to the accomplishments in that year by Scheele, Lavoisier, Wiegleb, Cadet, Bergman and Comus, ending his rehearsal with, "On the first of August, 1774, Priestly discovered oxygen, the immediate results of which were the overthrow of the time-honored phlogistic theory and the foundation of chemistry on its present basis." He then suggested: "American chemists should meet on the first day of August, 1874, at some pleasant watering-place, to discuss chemical questions, especially the wonderfully rapid progress of chemical science in the past hundred years"; adding, "Centennial celebrations are now in order. The Bostonians have renewed the memories of the Boston Tea Party. Already the country resounds with preparations for a National Centennial in 1876. Why should not chemists meet to enjoy a social reunion in commemoration of events important alike to science and civilization?"

This call promptly met with numerous favorable responses, among them one from Rachel L. Bodley, professor of chemistry in the Woman's Medical College of Pennsylvania, who proposed that "the Centennial gathering be about the grave of Priestly" in Northumberland, Pennsylvania, and that the meetings "be in the quaint little church built by Priestly, where might be exhibited the apparatus devised by the

great scientist, and used in his memorable experiments."

Professor Bodley's suggestion was universally approved and adopted and a most satisfactory meeting was held. It was presided over by Dr. Charles F. Chandler, and seventy-seven chemists, from widely separated parts of the country, were present, fourteen of them being among those present at Portland the previous year. The record of the celebration of the "Centennial of Chemistry" at Northumberland is quite extensive and it covers ninety-five pages of the *American Chemist,* in the August–September and December numbers for 1874. Of special historical interest are "A century's progress in chemical theory," by Dr. T. Sterry Hunt; "A century's progress in industrial chemistry," by Dr. J. Lawrence Smith; and "American contributions to chemistry," by Professor Benjamin Silliman. The last-mentioned address deals with the learned societies; early scientific foundations; the founding of the first professorships of chemistry; journals and periodicals devoted to science; and a list of papers on chemistry published in the United States prior to 1874; together with interesting biographies of the older American chemists.

At the business meeting Professor Persifor Frazer proposed the formation of a chemical society, which should date its origin from the centennial celebration, but this met with opposition on the grounds, by some, "that this country was too large and that it would be impossible to centralize its chemical research," while others, who opposed an independent body, advocated earnest cooperation with the American Association for the Advancement of Science, adding "that, if a National Chemical Society were formed, it should be a permanent section of that body." The outcome was that a resolution was adopted appointing a committee of five, with Dr. Bolton as chairman, to cooperate with the American Association for the Advancement of Science at its next meeting, to the end of establishing a chemical section on a firmer basis. This action was taken at Northumberland on August 1. The permanent sub-section of chemistry of the American Association for the Advancement of Science was organized at Hartford on the twelfth of the same month.

But, as well indicated in Dr. Bolton's original call for the centenary celebration, the national idea was permeating this country. The events of, and those following, the Civil War; the linking up of widely distant states and territories by rail and telegraph; the stand taken with foreign nations; the better comprehension of what this country was and its possibilities, developed a national consciousness, in the seventh decade of the nineteenth century, to even a higher degree than that which prevailed following the winning of the Revolutionary War, and the establishment of the nation. This growth in national consciousness and of the belief that chemistry could be best advanced by independent self-expression inevitably led to the formation of a national organization of and for chemists, which was realized in the American Chemical Society. This occurred at New York City, where there was a large concentration of chemists, on April 6, 1876, the declared object being, "the encouragement and advancement of chemistry in all its branches."

Although from the outset the larger proportion of members enrolled resided outside of New York City; the presidential office was successively filled by eminent chemists; regular meetings were held; and a journal published for more than a decade, the society led a precarious existence.

By 1889, its membership, which had never exceeded 320, had fallen to 200; dissatisfaction was generally expressed, and a movement was on foot to form another rival organization. A meeting was called to ascertain the causes and the remedies, and the non-resident members were especially urged to present their views. As a result, it was learned that the organization had come to be looked upon as a local New York society with non-resident members, having very little association with it, attached: and the remedies offered were the holding of migratory meetings, by which the society might be brought to its members, and the formation of local sections.

These suggestions were accepted, migratory meetings and local sections provided, and the first meeting planned for Newport, R. I. It was held on August 6 and 7, 1890, and proved most successful. Immediately the chemists of Rhode Island proceeded to effect the formation of a local section, which was chartered in 1891, and to-day it stands first in seniority among the fifty now chartered. The effect of these changes, as reflected in the membership, was at once apparent. In 1891, the membership increased to 300, by 1896 to 1,000, by 1901 to 1,800, while in 1924 it was recorded as 14,400.

The society has grown by accretions and absorptions. It absorbed the Cincinnati Chemical Society in 1891 and the Washington Chemical Society in 1893, the *Journal of Analytical and Applied Chemistry,* the *Review of American Chemical Research,* and the *American Chemical Journal,* the expectations being that every chemist could find all his professional needs met in a single organization, and that by reducing the number of chemical organizations and publications, a marked economy in time, effort and money might be secured for the chemists. This condition actually obtained until about the beginning of this century, when new journals sprang up and new socie-

ties to cultivate special fields in chemistry formed, so that to-day, apart from the foreign chemical societies, having affiliations in this country, I find some ten additional societies for chemists, requiring in addition to initiation fees, yearly dues exceeding one hundred dollars, and issuing some ten journals, which must be read, or searched, in keeping up with the literature. With such development in a little over twenty-five years, one wonders what the condition will be at the end of this century. Evidently there should be an obvious purpose and an unoccupied field to warrant such additional burden being placed on chemists and the community.

The founders of the American Institute of Chemists recognized that as the practice of chemistry spread a need was created for an organization which should represent and promote the profession of chemistry, as the bar and medical association in various countries represent and promote the interests of the practitioners of law and medicine, while protecting the community by the formulation and proclamation of standards governing practice, procedure and professional conduct, and by certification of professional qualifications. The avowed purpose in the creation of the American Chemical Society was "the encouragement and advancement of chemistry in all its branches," and its record testifies that it has most admirably fulfilled the purpose for which it was created, but from the very nature of its organization it is unsuited to perform the functions for which the institute was created and moreover these are wholly foreign to the purpose for which the American Chemical Society was created. Fortunately, these two organizations occupy quite independent fields, complementing one another to the better advancement of chemistry and the chemist and to the better advantage of mankind whom both serve.

CHARLES E. MUNROE

OCEANIC CIRCULATION[1]

FOR many years past the Museum of Comparative Zoology and the U. S. Bureau of Fisheries have carried on oceanographic explorations in harmonious cooperation; recently in collaboration with the North American Committee on Fisheries Investigations.

Since 1912, the chief field of exploration of this joint enterprise has been the Gulf of Maine, out to the edge of the continent, with the coastal waters to the east, and to the west and south, of that area. Commenced on the schooner *Grampus,* and continued to date on the fisheries steamers *Albatross, Halcyon* and *Fish Hawk,* the exploration has resulted in perhaps as detailed a knowledge of the distribution of temperature and of salinity, regionally, with depth, and with the change of the seasons as can be claimed for any other part of the sea of like area.

A general survey of the plankton, vegetable as well as animal, has also been made. And as its own special province, the Bureau of Fisheries is carrying on a comprehensive study of the biology of the important food fishes, some of the results of which are included in the "Fishes of the Gulf of Maine" (Bulletin, U. S. Bureau of Fisheries, Vol. 40, Part I, 1925).

Besides the Gulf of Maine project, which is a continuing one, explorations of the coast water from Georges Bank to Chesapeake Bay were carried out by the *Grampus* in the warm summer of 1913 and the cold summer of 1916.

The oceanic triangle Chesapeake Bay-Bermuda-Bahamas and the straits of Florida were surveyed oceanographically by the Bureau of Fisheries and the U. S. Coast and Geodetic Survey jointly in the winter of 1914. And in the winter of 1919–1920 observations were taken along the south Atlantic coast and about Cuba by the *Albatross.*

Preliminary statements of the results of these various cruises have appeared in SCIENCE, in the annual reports of the Bureau of Fisheries and in the bulletin of the Museum of Comparative Zoology. A comprehensive account of the oceanography of the Gulf of Maine region nears completion.

During these explorations, it has become increasingly evident that the key to many puzzling phenomena, biologic as well as physical, is to be sought in the circulation of the water on the continental shelf. Problems of special interest are: (1) the extent to which the temperature of the coast water along Nova Scotia and to the southward is influenced by the Polar Stream, popularly known as the Labrador current, on the one hand, and by the so-called "Gulf Stream" on the other; (2) the source of the highly saline water of moderately high temperature which lies on the bottom of the deeper basins on the continental shelf, as, for instance, the Gulf of Maine, and (3) the involuntary drifts of pelagic fish eggs and larvae, and of the plankton.

The circulation of the sea may be studied by indirect methods and by direct; both are being employed.

At the suggestion of the North American Committee on Fisheries Investigation, a comprehensive survey of the surface drifts in Eastern Canadian and United States waters by drift bottles has been carried on by the Bureau of Fisheries and by the Biological Board of Canada since 1922. Some thousands of bottles have been put out along lines calculated either to give cross-sections of known or suspected lines of drift or to delimit the separation between opposite or eddying

[1] Presented at the annual meeting of the American Geophysical Union in Washington, D. C., May 1, 1925.

currents. The number of recoveries (upwards of 20 per cent. for the U. S.) has been so large and they have been so consistent that the results are more significant than could have been expected. And, I may add, they fall directly in line with the circulation deducible from regional inequalities in density and from the distribution of salinity, of temperature and of the plankton.

It is still too early for a general statement. But it seems thoroughly established that the Labrador current exerts only an indirect effect anywhere to the west or south of the Laurentian channel, but that the cold water which floods westward along Nova Scotia in spring and early summer, some of it to enter the Gulf of Maine, is given its low temperature chiefly by ice melting, partly in the Gulf of St. Lawrence, and, more directly, outside the latter in the region of Banquereau and Sable Island Banks.

The circulation in the large basins on the shelf—the Gulf of Maine, for instance, and the basins along Nova Scotia takes the form of anti-clockwise eddies, while the water eddies clockwise around the shoal banks.

The mixture of water taking place along the edge of the continent, in the zone of contact between the cold banks water of low salinity, on the one hand, and the much warmer and saltier water of the open Atlantic, on the other, is heavier than either of its two constituents; hence it sinks, and as it sinks draws in water from either hand toward the sinking zone. This process of cabbeling, now known to take place along the continent from the Grand Banks to Chesapeake Bay, is the source of the so-called "slope water," which, turning to the right under the effect of the earth's rotation, is pumped into the Gulf of Maine as a bottom current by a rather steep density gradient obtaining throughout the year.

Drift bottles and densities combined make it highly probable that it is the draft of surface water toward this sinking zone, with the earth's rotation constantly deflecting it to the right, which is responsible for the southwesterly drift which has often been reported over the outer part of the continental shelf west of Cape Cod, and which was demonstrated by the fact that a large proportion of the bottles set adrift south from Cape Cod were picked up along North Carolina and Virginia.

Studies of the occurrence of pelagic fish eggs and larvae make it highly probable that the eddying circulation of the Gulf of Maine plays a rôle of great importance, in causing extensive involuntary migrations for most of the important food fishes, these taking to bottom far from where they are hatched. As a hint of what we may expect, I may add that while cod spawn abundantly in Massachusetts Bay, towing carried on there last winter suggests that practically all the eggs drift out of the bay before hatching, so that the resultant fry are to be sought perhaps on Nantucket shoals, perhaps on Georges Bank, perhaps even further afield.

The distribution of salinity affords ample proof that the river water flowing into the Gulf of Maine hugs the land as it eddies around anti-clockwise. Thus the nutritive substances washed down from the land should be most abundant close in to the shore—and this is corroborated by the fact that the greatest production of planktonic plants takes place here near land. The inflow of off-shore water into the gulf is into its right hand (eastern) side, so that tropical as well as arctic immigrants are to be expected—and have actually been recorded—more often there than in its western side. Conversely, drift bottles, current measurements and hydrographic evidence combine to locate the outflow from the gulf as along Cape Cod, out past Nantucket Shoals and so westward and southwestward. But the dominant drift divides off Cape Cod, part continuing to eddy eastward toward Nova Scotia, deflected by the rising slope of Georges Bank. And this eastward component, forming the southern side of the anti-clockwise Gulf of Maine eddy, is so well defined that the great majority of the recoveries of drift bottles set out off the coast of Maine and off Cape Ann have been from the west coast of Nova Scotia or from the Bay of Fundy, and after comparatively uniform periods of drift.

Although few measurements of currents by current meters have been attempted from Bureau of Fisheries vessels—being so time-consuming—a very extensive series has been carried out by the U. S. Coast and Geodetic Survey in the neighborhood of Nantucket shoals, in Massachusetts Bay, and along the arc of the southern rim of the Gulf of Maine: and the dominant drifts deducible therefrom prove generally consistent with the bottle drifts.

Although not strictly within the scope of this report, studies of the migrations of the codfish carried on for the past two years by the Bureau of Fisheries, and those on migrations of mackerel planned for the coming summer, have a direct oceanographic bearing, being intimately connected with the problems of circulation.

The work of the International Ice Patrol assumes increasing importance in American oceanography. And as none of the other reports listed for to-day's meeting seem to include this, a brief statement will not be out of place here.

Since the inception of the patrol, the taking of serial temperatures and salinities has been a regular part of the program of the Coast Guard cutters which

maintain the patrol from March to July, as well as a close plotting of the drift-tracks of individual bergs.

The result has been a great increase in knowledge of the interaction of the Labrador and Gulf Stream currents around the Grand Banks, which finally, we hope, will enable the drifts of bergs to be predicted to a much greater extent than is now possible.

Lieutenant Commander E. H. Smith, who has taken the oceanographic records and made the observations on the ice for the past few years, is now working up the hydrodynamic aspect of the results at the Geophysical Institute in Bergen.

HENRY B. BIGELOW
MUSEUM OF COMPARATIVE ZOOLOGY,
CAMBRIDGE, MASSACHUSETTS

BRAYTON HOWARD RANSOM

DR. BRAYTON HOWARD RANSOM, chief of the zoological division, Bureau of Animal Industry, United States Department of Agriculture, died in Washington, D. C., at 11:00 p. m., on September 17, 1925, after an illness of about three weeks. He was only forty-six years old, a comparatively young man, but in the short space of that brief lifetime he had crowded more of valuable achievement than most men may hope for in the biblical allotment of three score years and ten. In the scope comprehended in his investigations he was quite unusual and in his grasp of the broad field of veterinary parasitology the writer would rank him next to the illustrious Railliet of Alfort, a much older man, retired from teaching a few years ago at the age of seventy.

It would be difficult to find another man who on the scientific side had done monographic systematic work on parasites and had established basic facts in the life histories of such important parasites as *Ascaris, Haemonchus, Strongyloides, Gongylonema, Habronema, Syngamus* and *Taenia ovis,* and who on the practical side had first found in the United States many of our economically important parasites, had contributed to our knowledge of the true pathological conditions or causes in the case of infestations with *Davainea echinobothrida, Cooperia punctata, Syngamus trachea* and *Ascaris lumbricoides,* had developed measures for the control of stomach worms in sheep and had originated and developed the famous swine sanitation system popularly known as the McLean County System, had developed the basic regulations of the United States Department of Agriculture for the control of parasites, especially trichinae and cysticerci, through the meat inspection service, and had established some of the fundamental facts on which dipping for cattle ticks is based. Such a man has nothing to do with the debates on pure science versus applied science; he sees only the field of science and does well the tasks before him. The investigations noted above are only the high lights selected from those represented in his bibliography of over 160 titles. This represents a quarter century of productive work. His bibliography is devoid of padding. He was not a dabbler. His most prominent characteristics were his extreme thoroughness and carefulness. He was painstaking to a degree, in spite of the fact that the responsibilities of life weighed on him unusually heavily and that he paid an excessive toll of nervous energy for this painstaking work.

Dr. Ransom was born in Missouri Valley, Iowa, March 24, 1879, and educated in the public schools of Bancroft, Nebraska. He received the following degrees: S.B., University of Nebraska, 1899; M.A., University of Nebraska, 1900; Ph.D., University of Nebraska, 1908. It was proposed by the University of Nebraska to confer on him the honorary degree of D.Sc. at the June commencement of this year, but owing to a misunderstanding he was unable to be present to receive the degree at that time. He was a fellow in zoology at the University of Missouri in 1900–1901 and at the University of Nebraska in 1901–1902. In 1902 he came to Washington as assistant in zoology in the Hygienic Laboratory of the U. S. Public Health and Marine Hospital Service and the following year succeeded Dr. Ch. Wardell Stiles in charge of the Zoological Laboratory of the federal Bureau of Animal Industry. In 1906 he was made chief of the laboratory and the laboratory was at that time made the zoological division. As chief of this division he became assistant custodian of the U. S. National Museum.

His sound counsel and scientific achievements were widely recognized among scientific groups. He was U. S. delegate to the Seventh International Zoological Congress, the Fourth Fisheries Congress and the First Pan-American Scientific Congress and a member of the editorial boards of the *Journal of Parasitology* and the *American Journal of Tropical Medicine.* He was a member of the American Microscopical Society (president), American Society of Naturalists, American Society of Zoologists, American Association for the Advancement of Science (fellow), American Society of Tropical Medicine (secretary-treasurer), American Veterinary Medical Association (honorary member), American Society of Parasitologists (councilor), Biological Society of Washington, Entomological Society of Washington, Helminthological Society of Washington (past president), Washington Academy of Sciences (vice-president), Société de Pathologie Exotique (foreign correspondent), Reale Accademia d'Agricoltura di Torino (foreign correspondent), Phi Beta Kappa, Sigma Xi, Beta Theta Pi and the Cosmos Club. In recognition of his work

on ascarids he recently had conferred on him the Gold Medal of the Seamen's and Tropical Diseases Research Association of Kobe, Japan.

As an executive Dr. Ransom was a man of vision in his attitude towards his problems and just, considerate and generous towards his associates in the laboratory. Although an outstanding figure himself, nevertheless he did not believe in the policy of a one-man laboratory consisting of a head surrounded by "dieners," and preferred to surround himself with scientific associates rather than with personal assistants. Under his supervision the zoological division has had a steady and healthy growth from the time he took charge in 1903, and at the time of his death Dr. Ransom had a technical staff of six associates at Washington and four technical associates in charge of as many field projects at various places in the United States. His death is a personal loss to all his staff. They were devoted to his interests, deeply concerned when his health and life were imperilled, and have maintained throughout a high morale consistent with the obligations imposed by his kindly treatment and intelligent supervision.

What has been said of Dr. Ransom as a scientist and executive implies correctly what may be said of him as a man and as a friend. He did not maintain one attitude in his professional and executive capacity and another in his personal relations. In all his relationships he was uniformly courteous, kindly, helpful and considerate, and these qualities, coupled with a certain personal charm, ensured him the regard and admiration of all who knew him. It has developed during his last illness that he had many troubles and burdens which he kept to himself, and it is the one regret of his many friends that they could not have shared or lightened these burdens. With a dignified and quiet reserve he carried these to the end by virtue of an extraordinary strength of mind and fineness of character. That this man should have fallen beneath his burdens in the prime of life and achievement is a tragedy. The only consolations of his friends are that he leaves an unblemished record and that it is not always an unkindly fate that one is spared the vicissitudes of old age and the uncertainties of life. Whatever there may be of reward for life well spent, work well done and service to humanity—that reward is his.

MAURICE C. HALL

HENRY ROSE CARTER

DR. HENRY ROSE CARTER, assistant surgeon general of the United States Public Health Service, a distinguished authority on yellow fever and malaria, died at his home in Washington, September 14, following an illness of several months.

Dr. Carter was born in Caroline County, Virginia, August 25, 1852. In 1873 he received the degree of civil engineer from the University of Virginia, and in 1879 he took his medical degree at the University of Maryland School of Medicine. In May of the latter year he entered the Marine Hospital Service (now the United States Public Health Service) as assistant surgeon. Later he held the posts of surgeon and senior surgeon in this Service, and in 1915 he was appointed assistant surgeon general. From 1904 to 1909 he was director of hospitals of the Panama Canal Zone.

Dr. Carter's work has been mainly in the fields of yellow fever and malaria. His name is not so well known to the layman as the names of General Gorgas and Walter Reed, but he undoubtedly belongs with them in the small company of men who have made the most significant contributions to our scientific knowledge of yellow fever and methods of combating it. It was a suggestion from Carter that led Walter Reed to undertake the experiments in Cuba which resulted in the epoch-making discovery of the mosquito transmission of yellow fever. As an officer of the Public Health Service he took a leading part in banishing the disease from the United States.

Dr. Carter was one of the small group who began the fight against yellow fever in Panama in 1904. For the last ten years he has been closely identified with the campaign which the International Health board has waged for the complete eradication of this disease. In 1915 he served as a member of the Board's Yellow Fever Commission, headed by General Gorgas. Since 1920 he has been a member of its Yellow Fever Council. Because of his intimate acquaintance with the yellow fever work of the last three decades and his position as the leading authority on the subject, he was asked by the International Health Board to prepare a history of the disease and to this work he devoted most of his time for the last few years.

In the field of malariology Dr. Carter has long held, as an officer of the Public Health Service, the same position of preeminence that he enjoyed in relation to yellow fever. His opinion has been eagerly sought in everything related to problems of malaria control.

The officers of the International Health Board of the Rockefeller Foundation join with the United States Public Health Service and public health workers everywhere in lamenting the death of a man who has done so much to rid the world of the two dread plagues—malaria and yellow fever.

SCIENTIFIC EVENTS

SECOND CONFERENCE ON THE STANDARDIZATION OF BIOLOGICAL PRODUCTS[1]

THE second international conference on the standardization of biological products was held at Geneva from August 31 to September 3, under the presidency of Dr. H. H. Dale, F.R.S., of London, and was attended by seventeen representatives from various countries. The members of the conference were welcomed by Dr. Rajchman on behalf of the Health Section of the League of Nations. The main business of the conference was to discuss the standardization of such products as pituitary extract, insulin, digitalis, salvarsan, thyroid gland, ergot and others, and each of these was the subject of a good discussion, and resolutions were formulated which received the unanimous support of the conference.

The first product which received detailed consideration by the conference was pituitary extract, upon which a report was presented by Professor Voegtlin. After a somewhat lengthy discussion resolutions were arrived at, declaring that the dry (acetone) extracted substance of the fresh posterior lobe of the pituitary gland, which was recommended by Professor Voegtlin to the Edinburgh conference as suitable for adoption as a standard of activity for pituitary extracts, and which has since been adopted as a standard for this purpose in the United States *Pharmacopoeia* (tenth edition), should be now definitely accepted as the international standard, that the authority responsible in any country for biological standardization should prepare such quantities of the standard as were needed for distribution, and that the health organization of the league should be asked to furnish a small sample of the standard as originally prepared for examination by the Edinburgh conference to any authority which might require it for the confirmation of its own national standard.

Professor Macleod introduced the subject of insulin, and recommended the adoption as the international standard of the dried preparation of insulin hydrochloride which, at the request of the Edinburgh conference of 1923, has been made at the National Institute for Medical Research, London, 1 mg of this preparation to be regarded as containing 8 units of insulin. Professor Meyer mentioned a new method devised by Professor Loewi, of the University of Graz, depending upon, what Professor Loewi held to be proved, an alteration by insulin of the distribution of dextrose between the plasma and corpuscles of shed blood. It was agreed that this method deserved further careful investigation, but that no recommendation could yet be made as to its adoption. The recommendation made by Professor Macleod was agreed to, and it was arranged that the standard preparation should be kept by the Medical Research Council, which would undertake to test the permanence of its potency from time to time, and that samples of the preparation should be sent to some responsible organization in each country which would undertake its further distribution to testing laboratories.

The conference accepted the principle of the standardization of salvarsan and its derivatives in relation to permanent standard preparations, and Professor Kolle, of Frankfort, was asked to accept the responsibility of preparing, maintaining and distributing the standards for the various products of this class.

Thyroid gland preparations were also discussed, and it was agreed, on the suggestion of Professor Reid Hunt, to adopt the standard of iodine content. The question of ergot was introduced by Professor Trendelenburg, who said that, of a number of testing methods he had examined, a test based on the paralyzing effect of these alkaloids on the inhibitory action of adrenaline on the movements of the isolated intestine of rabbits and guinea-pigs appeared to be most promising. The conference decided that the question of the biological standardization of ergot was not yet ripe for final decision.

After various other substances had been considered, Professor Poulsson presented a memorandum dealing with methods proposed for standardizing for vitamin content the substances used in medicine for supplying vitamins to patients. He recommended the method already adopted in the United States *Pharmacopoeia* (tenth edition) for standardizing cod-liver oil for the growth-promoting factor (vitamin A). He stated that tests were already available, though less certainly quantitative in their interactions, for the antirachitic vitamin, the water-soluble growth-promoting vitamin and the antiscorbutic vitamin. A discussion ensued, in the course of which it was suggested by Dr. Dale that the present conference was hardly suitable for the discussion of the whole question of the biological standard of vitamins. It appeared to him that such a discussion could more suitably be undertaken by a special conference analogous to the serological conference, attended by recognized experts in this special branch of inquiry.

[1] From the *British Medical Journal*.

THE COLUMBIA-PRESBYTERIAN MEDICAL CENTER

A REPORT on the progress of the fund to provide the Presbyterian Hospital's share of the cost of construction of the new Medical Center being erected at Broadway and 168th Street has been made public by Dean Sage, president of the hospital. Mr. Sage

said that a total of $6,250,000 had been received to date. The sum needed is $7,000,000.

In disclosing the status of the fund Mr. Sage revealed that a gift of $100,000 had been made anonymously a short time ago. Earlier several other substantial donations had been turned over to the fund by anonymous givers. Among the larger subscriptions of recent receipt were a gift of $5,000 from William D. Baldwin and one of $5,000 from Mr. and Mrs. A. R. Kuser, of Bernardsville, N. J.

Mr. Sage announced that the two gifts of $25,000 each made last spring by Miss Annie Burr Jennings and Mrs. Walter B. James had been made to establish two five-bed medical wards. The wards are to be memorials to "the distinguished services of Dr. Walter B. James to the Presbyterian Hospital and to medical science."

A committee has been formed drawn from the hospital Board of Managers and from friends of the institution to speed the raising of the $750,000 still required. The committee was named at a luncheon at the Downtown Association and the plans call for the raising of the sum before the winter.

A year ago when the Medical Center, which will be one of the finest of its kind in the world, took form, the hospital had on hand about $2,500,000 of the sum required. Columbia University, which joins in the establishment of the center, had its share ready. In a public appeal for help, which had as its goal $4,500,000, the hospital last winter raised the sum of $3,640,000.

The annual meeting of the Uptown Medical Center Association, Inc., was held on October 5, at the Washington Heights Chamber of Commerce, 1042 St. Nicholas Avenue. The association was formed by residents of the Heights section to collect $400,000, with which to build a floor in the hospital unit of the center and also to cooperate in any way possible in the construction of the entire plant. So far the association has raised more than $156,000.

The first unit of the center, a $10,000,000 building, which will house the College of Physicians and Surgeons of Columbia University and also the hospital, is now under construction. Ground was broken this spring and the building is expected to be ready for occupancy in 1927. The university is contributing $3,000,000 to erect its section of the building.

THE SHEDD AQUARIUM

A SPECIAL investigative mission for the Shedd Aquarium left Chicago on October 3 to study the construction, scientific and educational features and management of European aquariums with a view that the Shedd aquarium to be built in Chicago will be an improvement over any existing institution of its kind.

The mission is comprised of Walter H. Chute, associate director of the Shedd Aquarium, and Leslie C. Stokes, engineer for Graham, Anderson, Probst & White, architects, who will draw the plans for the Chicago institution. They will be gone about two months. Immediately upon their return they will, in company with George F. Morse, director of the Shedd Aquarium, visit and make a similar study of American aquariums.

Mr. Chute and Mr. Stokes will, during their research, take into account both the mistakes and the desirable features of the leading aquariums of the world. Their findings and deductions will be incorporated in the plans to be drawn by Mr. E. R. Graham. European aquariums which will be visited include those at Naples, Monaco, Berlin, Antwerp, London, Leipzig, Dresden, Manchester, Plymouth, Blackpool and others.

At Naples special attention will be given to that aquarium's famous invertebrate collection. The Naples aquarium has been especially successful in keeping delicate species of marine life on exhibition. Methods used in handling them will be studied. The biological research laboratories of the Monaco institution will be especially studied there, and in Berlin the only artificial salt water system that has proved satisfactory will be investigated.

Both the Antwerp and London aquariums are new ones. The artificial lighting in the tanks at London is especially interesting and effective, as well as natural backgrounds used there and designed by Miss Proctor, curator of reptiles in the Zoological Gardens in Regents Park.

THE OPTICAL SOCIETY OF AMERICA

THE tenth annual meeting of the Optical Society of America will be held at Cornell University from October 29 to 31. In addition to a number of contributed papers and committee reports on such subjects as radiation, spectrometry, photography, physical optics, geometrical optics and physiological optics, there are two invited papers, one by Professor Simon H. Gage, of Cornell University, on "The microscope: Its development and some recent improvements," and the other by Professor E. M. Chamot, of Cornell University, on "Chemical microscopy: Its aims and possibilities."

There are two other important items on the program: Dr. H. E. Ives, of the Bell Telephone Laboratories, Inc., president of the society, will deliver his retiring presidential address on "Some photographic problems encountered in the transmission of pictures by wire"; and Professor Dayton C. Miller, of the

Case School of Applied Science, will give an evening lecture on "Contributions of optical measurements to physical theory." Professor Miller will discuss, among other things, his recent ether drift experiments at Mount Wilson.

The Optical Society of America was founded in 1916 to "serve the interests of those who are engaged in any branch of optics, from fundamental research to the manufacture of optical goods." Its present officers are:

President: Herbert E. Ives,
Bell Telephone Laboratory, Inc.,
New York City.
Vice-president: W. E. Forsythe,
Nela Research Laboratory,
Cleveland, Ohio.
Secretary: F. K. Richtmyer,
Cornell University,
Ithaca, N. Y.
Treasurer: Adolph Lomb,
Bausch and Lomb Optical Co.,
Rochester, N. Y.

The meetings are open to the public. A detailed program may be had by writing to the secretary.

SCIENTIFIC NOTES AND NEWS

THE autumn session of the National Academy of Sciences will be held at the University of Wisconsin on November 9, 10 and 11. The local committee consists of C. K. Leith, *Chairman;* C. E. Allen, George C. Comstock, L. R. Jones, Max Mason, C. E. Mendenhall, Joel Stebbins and E. B. Van Vleck.

ON the occasion of the meetings of the German Chemical Society at Nuremberg on September 2, Professor Gustav Dammann, of Göttingen, was presented with the Liebig commemorative medal of the society for his work on the properties of crystals, and Professor Otto Warburg, of the Kaiser Wilhelm Institute of Berlin, was presented with the Adolf-Baeyer commemorative medal for his researches on the metabolism of tumors.

DR. ALOIS K. KOVARIK, professor of physics at Yale University, was presented with the medal of the University of Prague on the occasion of his recent visit to the university, where he gave a series of lectures.

F. L. STEVENS, professor of plant pathology at the University of Illinois, was recently granted a doctorate by the University of San Marcos at Lima, Peru, in recognition of his studies on tropical fungi.

THE Ecuadorean government has awarded the medal of merit to Dr. Michael E. Connor, a member of the International Health Board of the Rockefeller Foundation, who has been engaged for about two years in studying yellow fever and laying plans for a campaign against the disease.

MEMBERS of the American Section of the Society of Chemical Industry gave on September 3 a testimonial dinner at the Chemists' Club to Dr. Allen Rogers, who was the secretary of the society for over ten years.

AT the University of Pennsylvania leaves of absence for the first half of the academic year have been granted to Dr. William Pepper, Jr., dean of the school of medicine; Dr. Charles B. Bazzoni, professor of experimental physics, and Dr. Francis C. Grant, associate in surgery.

ORVILLE WRIGHT has accepted the chairmanship of an advisory committee for the new school of aeronautics at New York University, which was recently established through a gift from Daniel Guggenheim.

THE American Röntgen Ray Society, meeting in Washington, D. C., has elected the following officers for the year 1926: Dr. Russell B. Carman, of Rochester, Minn., *president;* Dr. P. F. Butler, Boston, *first vice-president;* Dr. Charles F. Richards, San Jose, Calif., *second vice-president;* Dr. Charles L. Martin, Dallas, Tex., *secretary;* Dr. William A. Evans, Detroit, Mich., *treasurer;* Dr. Harry W. Bachelor, Toledo, Ohio, *librarian.*

THE British Röntgen Society has elected officers for the session 1925–26 as follows: *President,* Dr. F. W. Aston, F.R.S.; *Vice-presidents,* Dr. Robert Knox, Dr. N. S. Finzi and Professor A. W. Porter, F.R.S.; *Honorable treasurer,* Mr. Geoffrey Pearce; *Honorable editor,* Dr. G. W. C. Kaye; *Honorable secretaries,* Dr. E. A. Owen and Dr. R. J. Reynolds.

J. S. HIGHFIELD will be installed as president of the British Junior Institution of Engineers at the inaugural meeting of the forty-fifth session on December 11, when he will deliver his presidential address.

PROFESSOR E. F. BEAN, of the University of Wisconsin and for some years assistant state geologist, has been named acting director of the state geological survey and state geologist by the geological survey commission to succeed Professor W. O. Hotchkiss, who has been made president of the School of Mines at Houghton, Mich.

GEORGE MIKSCH SUTTON, of the Carnegie Museum, Pittsburgh, has been appointed Pennsylvania State Ornithologist, with headquarters in Harrisburg.

PROFESSOR HENRY H. NORRIS, formerly head of the department of electrical engineering at Cornell Uni-

versity, has resigned as assistant to the president of the McGraw-Hill Company, Inc., to affiliate himself with the Boston Elevated Railway as educational adviser.

NORMAN A. SHEPARD, who for the past six years has been in charge of the organic chemical research department of the Firestone Tire & Rubber Company of Akron, Ohio, has been made director of research, covering all chemical research work.

DR. W. A. KUNTZ, until recently assistant plant pathologist of the Florida State Plant Board, has been appointed assistant plant pathologist at the Florida Experiment Station and assigned to work in connection with the tomato disease investigations which are being conducted in cooperation with the U. S. Bureau of Plant Industry.

CHESTER A. LEE, assistant forester of the Colorado National Forest at Fort Collins, has been appointed farm forestry specialist at Colorado College.

ROBERT PFANSTIEL has recently resigned his position as section chief in the Chemical Warfare Service at Edgewood Arsenal, Md., to accept a position as research chemist with the General Chemical Company.

E. D. GARDNER, mining and explosives engineer, has been appointed acting superintendent of the Southwest Experiment Station of the Bureau of Mines, Tucson, Arizona.

DR. F. F. NORD, of the division of chemistry of the Physiological Institute, Berlin, has arrived from Germany to do research work in the section of biochemistry of the Mayo Foundation, University of Minnesota.

DR. EDWARD VERMILYE HUNTINGTON, professor of mechanics at Harvard University, has been appointed an exchange professor from the university for the year 1925–26 under the interchange agreement between Harvard University and the western colleges. Professor Huntington's term of service will fall in the first half-year.

GLENN W. HERRICK, professor of entomology in the College of Agriculture at Cornell University, is going abroad to spend his sabbatic leave visiting entomologists and laboratories in France and Italy.

DR. ALEŠ HRDLIČKA, of the Smithsonian Institution, recently gave a lecture before the Royal Anthropological Institute on the results of his trip to India, Australia and South Africa. Dr. Hrdlička exhibited fragments of human remains, which he intends to present to the British Museum, where they will take their place with the other remains of Rhodesian man.

IN connection with the Exposition of Chemical Industries which opened in New York on September 29, the following addresses were made: Tuesday, "The application of research to industry," by Dr. Arthur D. Little; Wednesday, "Sources of information for chemists and engineers," by H. E. Howe; Thursday, "Buying and selling the products of chemistry," by William Haynes; Friday, "The American chemical industry of to-day," by Dr. Charles H. Herty.

DR. WILLIAM M. DAVIS, professor of physical geography at Harvard University, delivered a public lecture on September 30 at Clark University which was on "The Grand Canyon of Colorado," illustrated with lantern slides and pictures.

DR. ALEXANDER O. GETTLER, toxicologist of the City of New York and associate professor of chemistry at New York University and Bellevue Medical College, gave a lecture before the American Section of the Société de Chimie Industrielle, on October 9, on "The rôle of chemistry in criminology."

DR. ALEXANDER FINDLAY, professor of chemistry in the University of Aberdeen, Scotland, addressed a joint meeting of the Washington Academy of Sciences and the Chemical Society of Washington on September 25.

ROALD AMUNDSEN, the Arctic explorer, is coming to the United States in the late autumn, when he plans to give a series of lectures.

As a tribute to the memory of Galileo Ferraris, the municipal authorities of Livorno Vercellese, his native place, have recently changed the name of the town to Livorno Ferraris. The event was made the occasion of a ceremony, electrical engineers from all parts of Italy being present. The house in which Ferraris was born in 1847 has also been acquired by the local authorities and is to be converted into a museum.

DR. EUGENE R. KELLEY, state commissioner of public health for Massachusetts, and lecturer in the school of public health of Harvard University, died by suicide on September 27, aged forty-three years.

DR. GEORG A. SCHWEINFURTH, the German explorer, botanist and archeologist, died on September 19, in his eighty-ninth year.

WE learn from the *Journal* of the American Medical Association that under the auspices of the National Dairy Exposition, from October 10 to 17, at Indianapolis, there will be a "health food show" under the personal direction of Dr. Elmer V. McCollum, professor in the School of Hygiene and Public Health of the Johns Hopkins University. Foods that have been found essential will be displayed and many other foods classified by Dr. McCollum, their food values charted and details of their preparation demonstrated

by nutrition workers. The purpose of the health food show is to educate the public to the quality of the more important agricultural foods and to emphasize the supplementary relation of some foods to others.

THE Harvard Medical School will give a course of lectures on "The care of the patient," which will discuss, from the viewpoint of clinicians in various lines of work, the care of the individual human subject, as against the care of the disease, as follows: October 6, Dr. David L. Edsall, dean of the Medical School; October 8, Dr. Franklin G. Balch, associate in surgery; October 13, Dr. Alfred Worcester, Henry K. Oliver professor of hygiene; October 15, Dr. Francis W. Peabody, professor of medicine; October 20, Dr. Edward W. Taylor, James Jackson Putnam professor of neurology; October 22, Dr. C. Macfie Campbell, professor of psychiatry.

THE eighteenth annual Electrical and Industrial Exposition will be held in the Grand Central Palace, New York City, from October 14 to 24. Approximately 20,000 electrical appliances and devices will be on display. The United States government will be the largest single exhibitor at the exposition.

THE Association of Deans of Medical Colleges of America will meet in Charleston from October 26 to 28. All the sessions will be held at the Fort Sumter Hotel.

THE fifth annual meeting of the American Association of Oral and Plastic Surgeons will be held in Philadelphia at the Bellevue-Stratford Hotel on October 26 and 27. Members of the medical and dental professions are invited to attend the scientific sessions which will be coincident with the clinical congress of the American College of Surgeons.

ARRANGEMENTS are now being completed for the sixth congress of the Far Eastern Association of Tropical Medicine, which is to be held in Tokyo from October 11 to 31; an attendance of over five hundred is expected. There will be an exhibition illustrating the medical history of Japan, and a demonstration of home-made medical and surgical instruments, medicinal plants and parasitological exhibits.

THE annual meeting of the German Congress of Tropical Medicine is to be held at Hamburg from October 15 to 17, in connection with the twenty-fifth anniversary of the foundation of the Tropical Institute.

THE Paleontologische Gesellschaft, an international society of paleontologists, met at Weimar in Thuringia from September 24 to 29, under the presidency of Professor J. F. Pompeckj, of Berlin. The organizing secretary was Professor Soergel, of Tübingen, who also led several of the excursions. These included visits to travertine quarries near Ehringsdorf, where relics of Neanderthal man have been found; to old gravels of the River Ilm, with their vertebrate and cultural remains; to the Bunter sandstone of Berka, which shows worm-burrows and tracks of Chirotherium, and to the Muschelkalk of Jena, besides the museums in Weimar and Jena.

THE Interstate Postgraduate Assembly plans to supervise a foreign clinic tour in 1926 to Naples, Rome, Florence, Venice, Bologna, Vienna, Munich, Budapest, Berne, Geneva, Amsterdam, The Hague and Brussels. The tour will start the latter part of April or the first part of May; besides the clinic features there will be trips to scenic points in the various countries. It is also announced that the assembly has established an "interstate community trust fund" under careful legal protection for perpetuating legacies and subscriptions, and that the income from the fund will be used in carrying on its scientific and postgraduate work. Dr. Joseph Schneider, Milwaukee, recently made a gift to the fund of $10,800, which will be maintained as the Schneider Endowment and the income devoted to medical research with particular reference to diseases of the eye.

IN 1924 the Research Information Service of the National Research Council sent to about 200 libraries in the United States copies of a reprint of the "List of Periodicals" from *Psychological Index*, no. 29, for 1922 (published in May, 1923), with the request that the libraries would check the journals currently received by them. From the copies which were checked and returned a compilation of the foreign serials currently received in libraries of the United States has been made as an aid to investigators in binding the journals cited in *Psychological Index* and in other bibliographical sources. This report is now in mimeographed form and a limited number is available for distribution upon application to the Research Information Service, National Research Council, B and 21st Streets, Washington, D. C.

SINCE the foundation of the *Journal of Scientific Instruments* two years ago, the editorial work has been carried out on behalf of the Institute of Physics at the National Physical Laboratory by Dr. John S. Anderson. The Institute of Physics finds that it is unable to continue the contribution of the amount payable to the National Physical Laboratory for Dr. Anderson's services, and the arrangements so far existing have accordingly been terminated. Dr. C. V. Drysdale, who has been a member of the editorial committee for some time, has been appointed editor beginning with the September number of the journal.

THE Chemical Foundation, Inc., has recently published a classified list of the patents owned by it,

grouped by subjects under the classification used by the U. S. Patent Office. This publication is the result of work of the foundation in cooperation with a committee of the Synthetic Organic Chemical Manufacturers Association, of which D. B. Keyes, of the U. S. Industrial Alcohol Company, was chairman. This list is published primarily in order that all manufacturers may have a quickly available and comprehensive listing of all patents owned by the foundation in which they may be interested, and it is hoped by means of this to avoid a repetition of the happenings in the case of methanol where important patents lay unlicensed in the files of the foundation for months after the product was being manufactured in Germany and imported into the United States in large quantities.

A LARGE collection of birds obtained in the valley of the Rio Purús, Brazil, by S. M. Klages, has recently been received at the Carnegie Museum, Pittsburgh. The collection contains many species hitherto not represented in the collections.

PRESIDENT COOLIDGE recently signed an executive order creating the reservation at Camp Upton as a National Forest and sanctuary. It is estimated that eighty years must elapse before the tract can return to its former wooded condition.

THE first progress report of the Foot-and-Mouth Disease Research Committee, of England, is largely of a preliminary nature: researches and experiments include those on cattle, sheep and pigs, and arrangements for this class of inquiry have been completed. The extensive and well-appointed buildings at Pirbright, Surrey, constructed and equipped as a cattle testing station, have been placed at the disposal of the committee by the Ministry of Agriculture and are admirably adapted for the purpose. The investigation will be of such a searching character as should lead to definite results, as far as present suggestions and theories can affect the situation.

UNIVERSITY AND EDUCATIONAL NOTES

BY the will of the late Dr. John W. Elliott, of Boston, Harvard University will receive $5,000 for the medical school and $5,000 for the general purposes of the college.

THE late Colin Thomson has bequeathed a quarter of the residue of his estate, estimated at £25,000, to the West of Scotland Agricultural College, to be devoted to research work and scholarships.

RECENT changes in the department of botany at the University of Pennsylvania include the appointment of Dr. William Seifriz, during the past year the holder of a National Research Council Fellowship at that university, to a professorship in botany. Dr. Irwin Boeshore, instructor in botany, has been promoted to an assistant professorship. Additional space to be devoted to individual laboratories for faculty and advanced students has been obtained by using the residence building of the Botanic Garden for that purpose.

NEW members of the faculty of the University of Louisville School of Medicine include Dr. Richard W. Jackson and Dr. Ralph J. Kaufman, professors of physiological chemistry, and Dr. M. W. Caskey, professor of physiology and pharmacology.

DR. LLOYD L. SMAIL, assistant professor of mathematics in the University of Oregon, has been appointed associate professor in the department of pure mathematics at the University of Texas.

W. T. READ, recently a member of the Yale University faculty and in charge of the technological courses at the Chemical Exposition in New York since their inauguration, has been appointed professor of chemistry at the Texas Technological College, Lubbock, Texas.

NEW appointments in the department of physics of Washington Square College, New York University, are: H. Van Norman Hilberry, formerly of the University of Chicago; W. Wenger, of Wooster College, and R. M. Williams, of Nebraska Wesleyan College. Dr. van der Merwe and Dr. Max Petersen have been promoted to the rank of assistant professors.

DR. EDWIN M. BAILOR has been appointed assistant professor of psychology at Dartmouth College.

KIRBY E. JACKSON, of Athens College, Alabama, has been appointed associate professor of chemistry in the State University of Washington.

DR. HELEN INGLEBY, of London, has been appointed professor of pathology at the Woman's Medical College of Pennsylvania, succeeding Dr. Maude Abbott, who has returned to McGill University in Montreal.

DR. CHI-TING KWEI, who recently received the Ph.D. from Princeton University, has returned to Changsha, China, where he is to be head of the physics department at the College of Yale in China.

DISCUSSION AND CORRESPONDENCE

THE UNDERWORLD OF SCIENCE

FEW scholars realize the existence of what may be termed the underworld of science, books which go through the motions of science regardless of its method or its purpose. The function of science, as Agassiz

used to say, is to "strive to interpret what actually exists." This process is always slow, and, however delightful, it requires a patience and exactness which is in a degree painful and which leaves every solution at the end still incomplete. Always a problem once solved, even partially, opens up a long vista of other problems. In this each student must build on the work of his predecessors. Moreover, a discovery worth while is not obtained by accident, nor is it the work of the beginner or the amateur. It requires the eye of a master to make a new observation, the hand of the master to devise a new experiment. Everything easy has been detected and found out. Facts in themselves, again quoting Agassiz, "are stupid things until they are linked together." All we know is derived from human experiences. We know nothing until we (that is humanity) have found it out. Science or knowledge is the result of human experience, tested and set in order. When intelligibly stated, in terms of human experience, it becomes truth, and truth is never complete; it provides for its own further extension. Old outlines of truth are abandoned in time, and once abandoned are never reclaimed. Individuals may relapse into ignorance, but cooperating science never takes a back track.

Individuals naturally grow impatient with the slow progress of testing realities, and seek for swifter answers to the problems of the universe. They would hurry up the future, not by science, but by something that looks like it, and is therefore equally good. The "running high jump" cares nothing for the difference between analogy or chance resemblance, and homology is fundamental identity. It thus confuses attractive fancy with verified truth.

I may illustrate "underworld science" by certain books which have come lately to my notice. In one of these, two sciences, astrology and anthropology, are hopefully united. There are in fact on our earth four seasons of three months each. Each month has its sign in the heavens, the constellation in which for the period the sun seems to be placed. These signs have each its Latin name usually of some animal or of other personality by which influence emanates. When the sun is in one of these signs, the earth is in the opposite, but it is the position of the sun which mainly controls humanity. When the sun is in Scorpio, the earth is in Taurus.

But it is the malignant scorpion rather than the turbulent bull which then directs human affairs. Our luckless planet, caught between these two tremendous agencies, can not fail to be affected and in its most sensitive feature, humanity, and at man's most impressive period, the day of his birth. And here the time-honored science of astrology impinges on one of the newest of sciences, anthropology.

In this particular underworld of knowledge it is recognized that four major races of men exist, the black, the yellow, the red and the white. In each of these races there are three distinct tribes, twelve in all. These correspond to the twelve signs of the Zodiac, the twelve constellations traversed each year by the sun. It is evident that such correspondence is not accidental, and the problem is to trace each different race to the influence of the constellation which has especially moulded it.

The author of a monograph on this subject shows this influence on each race at its initial moment. The sign of the Zodiac gives the character, and race-heredity continues it. But men of other races born under the same sign are sure to show many traces in common with the race thus initiated.

This is proved by a series of illustrative photographs. On each separate page appears a central portrait showing the typical Caucasian, Hindu, Jew, American Indian, Chinaman, as well as one of each of the seven other races. Around each of these typical pictures are grouped portraits of men of European stock, born in the month from which the race in question dates, and these men naturally show features to correspond. Hence in the month devoted to Hottentots, we would find swarthy, curly-haired gentlemen with uptilted noses. These are not born of Hottentot blood, but modified by birth under the Hottentot sun. In the Jewish month are Saxons adorned with the nose called Roman, and so on. To provide these portraits and to group them properly requires a good deal of research, of the type characteristic of the underworld.

Another author, probably a humorist in disguise, elaborately proves the separate origin of the three primal races of man. These sprang from three different species of ape: the Aryan races (Nordic, Latin, Slavic and Hindu) from the chimpanzee; the Mongolian from the orang-utan, and the negro from the gorilla. The occasional occurrence of Morons (currently called Mongolian) in white races proves that there has been an admixture of orang blood among the chosen people, descendants of the chimpanzee. Treated in this fashion anthropology can proceed as merrily as astrology, in leaping from assertion to assertion.

The authors of books of this type often complain bitterly of the "conspiracy of silence" by which scientists strive to smother their inspired or inspiring contributions. It is true that scientific men seldom give them the public notice they deserve, for activities of this underworld of analogy and fancy, the "lunatic fringe of science" is in itself an interesting study.

DAVID STARR JORDAN

STANFORD UNIVERSITY

ARITHMETIZATION IN THE HISTORY OF MATHEMATICS

ARITHMETIZATION represents in the development of mathematics a general tendency of the widest application and hence it is comparable with the principle of evolution in the natural sciences. Notwithstanding the fact that traces of our modern arithmetical algebra appear in an ancient Egyptian work written by Ahmes about 1700 B. C., yet the first really developed algebra was the geometrical algebra of the ancient Greeks, and this has been slowly arithmetized —first by the Greeks themselves, as may be seen in the *Arithmetica* of Diophantus, and later by authors of various other nations.

One of the most influential writers on the arithmetization of the Greek geometrical algebra was R. Descartes (1596–1650), who, in particular, emphasized the fact that he used the symbols a, $a,^2$ a^3 algebraically, and that he did not understand thereby a line, a surface and a solid, respectively. Even F. Vieta (1540–1603), who is commonly called the father of modern algebra, still adhered to the ancient custom (which was, however, not universal) of representing a line by the symbol a, while the symbols a^2 and a^3 were used to represent a surface and a solid, respectively. This usage is reflected in the modern terms linear, square and cube, respectively.

The arithmetization of trigonometry may be illustrated by the change in the definitions of the trigonometric functions. With possibly a few exceptions these functions were regarded as line segments until the time of the great Swiss mathematician L. Euler (1707–1783), and even Euler did not explicitly define them as abstract numbers, as is now commonly done, but he obviously regarded them as such numbers. In the earlier works the values of these functions depended not only on the angle but also on the radius of the circle, or the length of the hypotenuse of the right triangle, with respect to which the functions were determined. For instance, the sine of 90°, that is, the *sinus totus*, had a large number of different values, including the following: 60, 120, 3438, 600,000, 10,000,000,000, etc.

Although analytic geometry and the calculus were founded comparatively recently, yet we find in their development also evidences of the growing tendency towards arithmetization in the development of mathematics. In particular, in analytic geometry the coordinates of a point were for a long time regarded as line segments instead of abstract numbers. A change in this respect was effected by the work of Euler, Lagrange and Monge. In fact, Euler began the use of complex coordinates but did not proceed as far in this direction as C. F. Gauss and A. L. Cauchy.

In the preface of the "Calculus of Observations," by Whittaker and Robinson, 1924, it is noted that "when the Edinburgh Laboratory was established in 1913, a trial was made, as far as possible, of every method which had been proposed for the solution of the problems under consideration, and many of these methods were graphical. During the ten years which have elapsed since then, the graphical methods have almost all been abandoned, as their inferiority has become evident, and at the present time the work of the laboratory is almost exclusively arithmetical. A rough sketch on squared paper is often useful, but (except in descriptive geometry) graphical work performed carefully with instruments on a drawing-board is generally less rapid and less accurate than the arithmetical solution of the same problem."

Thus far we have spoken only of the principle of arithmetization in the history of elementary mathematics. In advanced mathematics this principle was especially emphasized by Weierstrass towards the close of the preceding century, and James Pierpont, of Yale University, treated the subject in a valuable article published in volume 5 of the *Bulletin* of the American Mathematical Society. The object of the present note is mainly to point out that in the development of mathematics there is clearly seen a broad fundamental principle of coordination, and that the study of the history of mathematics is facilitated by an explicit recognition of this principle. The great emphasis which the ancient Greeks placed on geometry gave to their mathematical developments an undue geometric bias, and this bias was naturally transmitted to the students of Greek mathematics for a long period of time. The later tendency towards arithmetization may be partly explained by this well-known situation. L. Kronecker expressed the arithmetization principle of evolution in the history of mathematics as follows: "God made integers, all else is the work of man."

G. A. MILLER

UNIVERSITY OF ILLINOIS

AVOIDABLE DIFFICULTIES WITH TERMINOLOGY IN COMPARATIVE ANATOMY

CONTRADICTIONS in anatomical terminology are one of the many disturbing factors with which a student in comparative vertebrate anatomy has to struggle. Courses in comparative anatomy have at least two purposes: to acquaint the student with the vertebrate plan and to serve as a preparation for embryology, human anatomy and medicine. Since the majority

of the students often are premedical students, the course should be so arranged that continuity with human anatomy and embryology is attained.

One of the greatest difficulties is the inconsistency in terminology in current text-books and manuals on the various vertebrate types. Consideration of a single organ system will illustrate this. In an anatomical work of recent date, admirable in execution and illustration, the mesonephros of the shark is called a "kidney," without any qualification or explanation of the term. The same criticism applies also to many manuals in use in courses in elementary zoology, in which the mesonephros of the frog is fully discussed as a "kidney." In other manuals the accessory nephritic duct of the shark is usually called a ureter, although it has no relation to the ureter of the amniotes.

In dealing with the genital system, the old term vas deferens is used almost exclusively in disregard of the preferable B.N.A. term "ductus deferens." The latter the medical student must know. At the base of the ductus deferens or Wolffian duct of the shark and the amphibian is a small dilatation which is called the "seminal vesicle." This term the student learns, and perhaps remembers, only to discover later that this terminal dilatation is not comparable to the seminal vesicle of human embryology, but corresponds to the ampulla ductus deferens, the mammalian seminal vesicles being evaginations of the Wolffian duct, which occur only in certain mammals, including man. In a like manner the enlargement of the oviduct of many amphibians is called a uterus, although it is more nearly homologous to the shell gland of certain sharks, and certainly should never be confused with the eutherian uterus.

This same criticism of terminology may be extended in a similar manner to the other systems and is the source of much confusion to the student. Assuming that the premedical student will carry some small bits of information and some few anatomical terms into the first year of medicine, it is evident that he must not only learn more terms, but must unlearn and relearn many of those current in general zoology and comparative anatomy. Otherwise he will not gain a clear idea of the homologies between the organs of the lower classes of vertebrates and man, and will lose one of the most valuable lessons of comparative anatomy—the position of man in a phylogenetic system. It is just as easy to present accurate terms in the first instance when all terms are new and equally unfamiliar to the student, as to use those which are anatomically incorrect and which must be abandoned later.

EARL THERON ENGLE

STANFORD UNIVERSITY

LUMINOUS SPIDERS

THE issue of August 21 contains a very interesting letter from Barnum Brown on his discovery in Central Burma of a luminous spider whose abdomen glowed with light while "fireflies sparkled here and there." May not this be analogous to the effect obtained by that prank of childhood when we caught and fed fireflies to the ordinary hop toad and then turned him loose on the lawn in front of the veranda to the consternation of the older folks, who could see but not comprehend the bouncing light. Maybe the spider had feasted plentifully on the abundant fireflies.

EDWARD PIERCE HULSE

In my opinion, there are three explanations of this luminosity: First, the eating of the luminous portions of fireflies by the spiders; second, injection by bacteria or fungi; third, a true luminous organ. Mr. Hulse touches upon the first possibility in his letter and the answer to this, I think, is to be found in the habits of spiders. Spiders are provided with sucking mouth parts, and do not devour the material as a whole. If this individual had selected only the luminous portions of fireflies, light would have shown not only on the abdomen, but through the thorax and head as well. I think the answer to the second possibility, injection by luminous bacteria and fungi, would hold equally true, that both thorax and head would have shown luminosity had the spider been injected. As a matter of fact, I was sufficiently close to determine accurately that only the abdomen glowed. I think that it was definitely provided with a true luminous organ.

BARNUM BROWN

SCIENTIFIC BOOKS

Telephone Communication. By C. A. WRIGHT and A. F. PUCHSTEIN.

"TELEPHONE Communication," written by Professor C. A. Wright in collaboration with Professor A. F. Puchstein, is a text-book intended for use in engineering schools. It deals primarily with the functioning of a telephone system in transmitting and reproducing speech sounds. In this connection it discusses sound, the operation of telephone transmitters and receivers in performing the conversions between sound and electrical energy; the transmission of electrical currents in lines and impedance networks, and the means of measuring and specifying the transmission efficiency of telephone circuits and apparatus.

One of the four parts of the book is devoted to recent developments in telephony, namely, the vacuum tube amplifier and its application to telephone lines, the carrier current system of multiplexing telephone lines and radio telephony. One chapter is given to measurements made in testing and maintaining telephone circuits, and one to interference between telephone circuits and from electric power lines into telephone circuits. In addition, brief discussions are given of the history of the telephone and the kinds, requirements and value of telephone service. Each chapter ends with a list of illustrative problems for the students and recommended references for the instructor, and the book closes with two appendices covering electrical fundamentals and laboratory problems.

Although the authors have by design practically eliminated references to the important signaling and switching functions of telephone systems, and to the economic and commercial phases of the communication business, it will be evident from the foregoing outline of the book that the scope is still rather ambitious for one volume. Illustrative of the range of material, statements, many of which are very brief, are made regarding such diverse subjects as electron theory, dynamic characteristics of vacuum tubes, legal aspect of the inductive interference problem, acoustics of rooms, fundamentals of good telephone service, radio broadcasting, construction of loading coils, and value of electrical communication service. While the book will undoubtedly give the reader some comprehension of the complexity of the problems of telephone communication, it is questionable whether the authors have not detracted from the value of their work by the attempt to cover too much ground. In attempting to say something on many topics they have been forced to treat many matters very casually.

The consideration is in general descriptive, although certain sections, such as those dealing with line transmission and filters, lead rather naturally to mathematical treatment. In discussing apparatus and systems the authors have wisely chosen to devote their material largely to an exposition of function and operation and to avoid detailed descriptions of the particular embodiments which have been used. The descriptive treatment of most of these subjects is probably the best that has yet been published under one cover. The technical discussions, as indicated above, suffer in many cases from lack of sufficiently extensive treatment. For example, it is doubtful whether from the material given on the propagation of electric waves over lines the student will get more than a superficial understanding of this subject. It would seem reasonable in a course such as one in which this text would be used that one of the main objects would be to ground the student thoroughly in the theory of the distribution of electrical currents and voltages in lines and circuits. In this connection it should be noted that the much used equivalent network method of handling lines, apparatus and circuits is not brought in. Some of the important theorems, such as Thevenin's, regarding transmission and circuits are not given.

In places the technical treatment is apparently lacking in clearness of conception. As an illustration, in explaining filters, the expression is frequently employed of filters offering "very high impedances" to currents of various frequencies, as synonymous with causing high attenuation. As a matter of fact the attenuation caused to certain frequencies by the introduction of a filter into a circuit may be very high and yet the impedance of the filter may be very low. This difficulty is probably due to a lack of appreciation of the distinction between resonant circuits and a wave filter, as the structure shown in Figure 128 is not a wave filter as ordinarily defined, since its attenuation constant is zero at all finite frequencies.

In discussing practical matters, the information given is in many cases wrong or misleading. For example, on page 9 it is stated that "practically all long telephone circuits are now loaded." In this country the longest and most important open wire circuits are not loaded. In a table on page 210 the critical frequency for loading in the United States is given as 2,200 cycles. In a sentence just above the table it is stated that "more recent practice has provided for critical frequencies of 2,800 and 5,600 cycles." These latter values and not 2,200 cycles are standard for practically all the loading now being applied in this country.

With regard to interference effects between power and telephone lines, it is stated that "If all the electromotive forces and currents in properly constructed distribution systems varied according to a sine wave no interference of a serious nature would occur." This of course ignores low frequency induction which, at times of abnormal flow of current due to grounds or short circuits on power systems, may cause operation of signaling and protective apparatus on telephone systems.

A section of the chapter on interference is devoted to the legal aspects of the inductive interference problem, and this indicates in a general way the trend of the legal opinion regarding the rights of the utilities involved. While this is an important aspect of the problem it has generally been found that cooperative action between the utilities concerned brings much better results than an attempt to determine solutions

in the courts. The great progress which has been made in the national and local cooperative movements now being carried on between the various wire-using utilities seems to justify this conclusion.

With the necessarily limited treatment which many of the subjects receive, it is obviously possible to raise the question as to whether some of the things which are omitted are not equally or more important than those which are included. The bearing of this and some of the other comments on the usefulness of the book in particular courses is naturally somewhat dependent upon the ideas of the instructor as to what he desires to teach.

To the matter of the justification for trying to teach in college a particular business to the student, and specifically in this case the telephone business, much thought has been given by various educators and engineers. From the standpoint of many communication engineers, the conclusion has been that such an attempt is not justified and that the instructor would do better to endeavor rather to impart to the student a good understanding of fundamental principles. A working knowledge of the theory of propagation of electric waves, for example, is useful not alone in telephone work but also in other fields. The instruction in this theory should be accompanied by illustrations of its various applications. Messrs. Wright and Puchstein have provided considerable material for such illustrations drawn from the field of telephony.

Despite questions, such as those indicated above, which can be raised against parts of the book, it will undoubtedly serve a useful purpose as an instruction manual since much of the material is distinctly an addition to that hitherto available for student use.

Le métabolisme de base. By ÉMILE F. TERROINE (Strasbourg) and EDGARD ZUNZ (Bruxelles). Presses universitaires de France, 1925, pp. 1–187.

THIS is the best book on the subject of metabolism published in a foreign language. It deserves high commendation on account of its full consideration of world literature, a treatment nowadays so unusual as to warrant special praise. It is indeed a pleasure to read in the French language exact reports of the work of Rubner, Benedict, Du Bois and others. An excellent critical review of the law of surface area as the standard by which basal metabolism may be measured leads the authors to the acceptance of this standard. Possibly more space than is necessary is devoted to the discussion of Newton's law of cooling as being the determinative factor in basal metabolism, because for many years no one has so considered it. The reviewer notes with regret, but not surprise, that his own experiments on the specific dynamic action of sugar and amino-acids are not fully understood. The cost of this excellent volume is 20 francs (94 cents), which is in striking contrast to charges inflicted upon foreigners by German publishing houses.

GRAHAM LUSK

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE AND EFFICIENT HYDROGEN ELECTRODE

THE writer, during his studies of the hydrogen ion concentration of certain Hawaiian soils and pineapple plant fluids, constructed a hydrogen electrode which proved very efficient and satisfactory in every respect for the work. This electrode was found to reach equilibrium in relatively less time than certain other well-known electrodes, and it is on account of this single merit that a description of its construction and operation is given herewith.

The principle on which the electrode is operated does not differ from that of other forms. The construction of the entire apparatus (Fig. 1) is very simple. It consists of a cell (7) made of a flat bottom glass tube 7.5 cm long and 2.5 cm in diameter, an electrode supporter (3) made of a glass tube 10 cm long and 0.5 in diameter, a hydrogen gas conductor (4) made of glass tubing, 15 cm long and 0.5 in diameter, and a No. 4 rubber stopper (5) through whose three holes are suspended the electrode-supporter, the hydrogen-gas-conductor and the salt bridge

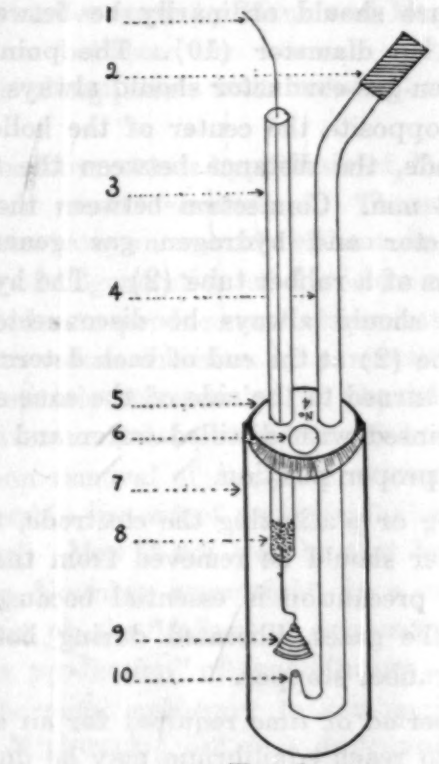

FIG. 1

or glass tube containing either concentrated KCL solution or agar-KCL. It is necessary that the electrode supporter and hydrogen-gas-conductor fit tightly and the salt bridge loosely in the rubber stopper, the reason for the latter being to provide an exit for the escaping hydrogen gas. The electrode (8), of a conical form, may be made by twisting a 15–25 cm long 22 gauge platinum wire (other gauges of greater diameter may be used) around the apex of a conical object, leaving at the same time an open space between the turns of the wire of from 1 to 1.5 mm and one at the apex about 2 mm in diameter. The open spaces are left for the purpose of allowing the hydrogen gas to pass through and thus bathe the entire surface area of the electrode. The length of the wire extending above the apical end of the cone-electrode should ordinarily measure about 2 cm, 0.5 cm of which is fused into the basal end of the electrode supporter, where it comes in contact with the mercury (8) enclosed therein. Connection between the electrode and the potentiometer is made by means of a copper wire (1). The hydrogen-gas-conductor, as seen in Fig. 1, forms a curvature of 180 degrees at the basal end, terminating in a point whose aperature should ordinarily be between 0.75 and 0.50 mm in diameter (10). The pointed end of the hydrogen-gas-conductor should always be situated directly opposite the center of the hollow base of the electrode, the distance between the two not exceeding 1–2 mm. Connection between the hydrogen-gas-conductor and hydrogen gas generator is made by means of a rubber tube (2). The hydrogen-gas-conductor should always be disconnected from the rubber tube (2) at the end of each determination, the basal end turned to the side of the cone-electrode by twisting, rinsed with distilled water and then returned to its proper position.

For cleaning or platinizing the electrode, the electrode supporter should be removed from the rubber stopper; this precaution is essential because of the influence of the gases, liberated during both processes, on the rubber stopper.

The short period of time required for an electrode of this type to reach equilibrium may be due to the great surface area which it exposes. The surface area of a 15 cm length of 22-gauge platinum wire electrode is about 2.2 square centimeters and that of a 25 cm length 3.75 square centimeters. A surface area between 2.2 to 3.75 square centimeters for such an electrode is considerably greater than that possessed by other types of electrodes. The shape of the electrode is also advantageous because it receives all the hydrogen gas as it is delivered by the conductor, distributing it at the same time over its entire surface by the helicoid movement of the gas. The hydrogen-gas-conductor, because of its position near to the bottom of the cell, is able to produce considerable agitation of the contents of the cell (solution) by the upward movement of the bubbles of hydrogen gas. Such an agitation is of great advantage because it brings all the parts of the solution in contact with the electrode and at the same time does not necessitate the use of a mechanical shaker.

The volume of the solution that is generally needed for the determination of the hydrogen ion concentration with the above apparatus is between 5 and 10 cc. It is possible to adapt the apparatus for smaller volumes of solution by using a smaller cell and mounting the electrode supporter and hydrogen-gas-conductor on a rubber stopper of smaller diameter. The writer does not, however, recommend the use of smaller volumes of solution than 5–10 cc., because of the rapid changes to which such smaller volumes of solution are subjected by rapid changes in the environment.

CHRISTOS P. SIDERIS
UNIVERSITY OF HAWAII,
HONOLULU, T. H.

SPECIAL ARTICLES

INACTIVATION OF INSULIN BY GLUCOSE WITH A COMMENT ON THE GENESIS OF DIABETES[1]

The inactivation of insulin by hydrogen and hydrogen sulphide and its reactivation by exposure to oxygen, recently reported from this laboratory,[2] suggested the possibility that the pancreatic hormone might be inactivated by reducing sugars, thus explaining their antidoting effects and conceivably throwing some light on the genesis of diabetes. This conjecture was very promptly turned to reality; for upon the second trial it was found that the power of insulin thus treated *in vitro* to lower the blood sugar of normal fasting rabbits was very much weakened. Further experiments in which insulin and glucose were incubated together proved even more convincing.

A fairly pure insulin A_3P_5 (meaning purified by five reprecipitations with amyl alcohol) and Merck's C. P. dextrose were used. The dosage was identical in all tests. Likewise the amount of glucose in the controls was always equal to that used in the crucial experiment. The control was accomplished by injecting the glucose solution on one side of the animal's

[1] From the Department of Vital Economics, University of Rochester, Rochester, N. Y.

[2] Allen and Murlin, Proc. Soc. Exp. Biol. and Med., 1925, XXII, 492.

body and the separately incubated insulin on the other.

Starting with a 1 per cent. solution of the dextrose, insulin was mixed with it in such concentration that by injection of one rabbit unit of the hormone not more than 10 mgm of sugar would be conveyed into the animal. By separate tests it was found that at least one gram of the same dextrose was necessary to raise the blood sugar perceptibly. Incubation was for one hour at 37–40° C. The potency of the insulin was reduced to about one third its former strength. Proceeding to 0.5 per cent. dextrose and so on down it was found that even greater inactivation (or destruction) occurred at the range 0.3 to 0.5 per cent., but that at 0.2 per cent. only slight reduction of potency occurred. A crucial point therefore lies somewhere between 0.2 and 0.3 per cent. A single experiment with its control must suffice by way of illustration. Further details will be found in a paper by R. S. Allen and the writer which will be published at an early date in the *American Journal of Physiology*.

Prep. No.		Blood sugar change mgms.	Average blood sugar change mgms.
AS_3	0.3 per cent. dextrose and insulin incubated 1 hr.	−36	
		−17	
		− 8	
		− 4	−16
		−16	
		−21	
		− 9	
AS_3C	same incubated and injected separately.	−56	
		−56	−62
		−73	

Not all grades of insulin are equally affected by sugar in this way; for Lilly's Iletin in two trials was not inactivated by 0.5 per cent. dextrose incubated one hour and three and one quarter hours, respectively. Our own crude insulin, precipitated with sodium chloride,[3] but not further purified, also is not inactivated. It contains much protein besides salt. Purified insulin is extremely sensitive to inactivation from a number of causes. Recently we lost a large batch, which seriously crippled this study, by treatment of a finely emulsified preparation with dilute HCl. This confirms the observation of Abel and his collaborators reported in a recent number of SCIENCE.[4]

To prove beyond a peradventure that excess of glucose in the circulation may inactivate insulin there present in normal amount it is only necessary to repeat the *in vitro* experiments in blood plasma. These experiments in completed form would now be available but for the accident referred to above. Preliminary results, however, bear out the hypothesis.

These observations taken in conjunction with the inactivation by hydrogen and by hydrogen sulphide furnish another link in the evidence necessary to prove that glucose and mannose antidote an overdose of insulin by their reducing property. The experiments with glucose explain also why such large doses of insulin are necessary to produce effects in animals which have previously received large injections of sugar (Gabbe,[5] Lesser,[6] Burn and Dale,[7] *et al.*). They explain why glucose given to diabetic (McCann and Hannon)[8] or normal (Higgins)[9] persons often causes a depression of the respiratory quotient, while fructose does not (Higgins; Wilder, Boothby, *et al.*);[10] for, as we have found in preliminary experiments, fructose has little, if any, inactivating effect *in vitro*.

The bearing of these facts upon the genesis of diabetes in man are obvious, especially in view of the recent demonstration by Burn and Dale, which confirms earlier work by Mann and Magath[11] that the distinction between the normal and the diabetic organism disappears with removal of the viscera (liver).

The food overstrain hypothesis of F. M. Allen has itself been much overstrained. Thousands of cases of diabetes are on record without any microscopic evidence of degeneration of the islets of Langerhans, and in order to produce such degeneration Allen was obliged to reduce the mass of pancreas in his experimental animals enormously (in physiological terms). If the liver must be present to produce the diabetic state upon removal of the pancreas we have at least a partnership instead of an individual agency to keep us normal. May it not well be that both Minkowski and Van Noorden were right, in a measure? The former set up the "failure of combustion"; the latter the "over production" of sugar theory. Banting gave us the hormone necessary to combustion, thus supporting Minkowski; *but it is destroyed by too much sugar.*

[3] Allen, Piper, Kimball and Murlin, *ibid.*, 1923, XX, 519.

[4] Abel, Geiling, Alles and Raymond, SCIENCE, 1925, August 21, LXII, 170.

[5] Gabbe, E., *Klin. Wochenschr.*, 1924, III, 1, 612.

[6] Lesser, E. J., *Biochem. Zeitschrift*, 1924, CLIII, 39.

[7] Burn and Dale, *Journ. Physiol.*, 1924, LIX, 164.

[8] McCann and Hannon, Johns Hopkins Hosp. Bull., 1923, XXXIV, 73.

[9] Higgins, H. L., *Amer. Journ. Physiol.*, 1916, XLI, 258.

[10] Wilder, Boothby, *et al.*, *Journ. Metab. Research*, 1922, II, 701.

[11] Mann and Magath, Arch. Int. Med., 1923, XXXI, 797.